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CHEMICAL & ENGINEERING NEWS

C&EN

AUGUST 8, 1994

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SOUTH AFRICA

Chemical industry braces to enter competitive world marketplace

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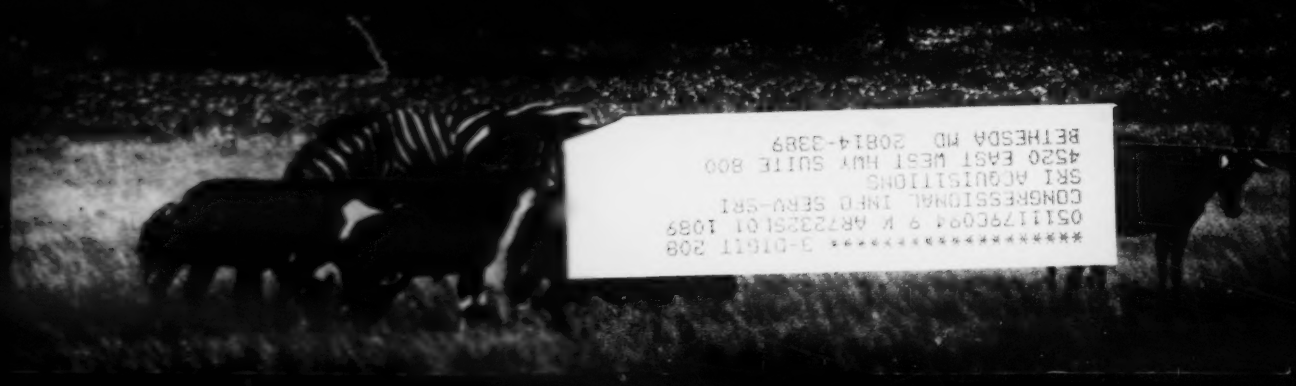

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C&EN

AUGUST 8, 1994

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Chemical & Engineering News
1155—16th St., N.W., Washington, D.C. 20036
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Published by
AMERICAN CHEMICAL SOCIETY
(202) 872-4600; TDD (202) 872-4432
John Kistler Crum, Executive Director
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PUBLISHING BOARD: Joseph A. Dixon *(Chairman); Board of Directors Chairman:* Paul H. L. Walter; *President:* Ned D. Heindel; Paul S. Anderson, Richard L. Deming, Paul W. Jennings, Barbara J. Peterson
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Subscription Rates 1994: Printed editions: nonmembers U.S. 1 yr. $115, 2 yr. $207; outside U.S. 1 yr. $152, 2 yr. $281. Air freight rates available on request. Rates above do not apply to nonmember subscribers in Japan, who must enter subscription orders with Maruzen Co. Ltd., 3-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan. Tel: (03) 272-7211. Single copies: Current $18. Rates for back issues and volumes are available from Microforms & Back Issues Office, ACS, 1155—16th St., N.W., Washington, D.C. 20036. Back and current issues available on microfilm and microfiche. Rates on request from Microform Program, ACS.

Chemical & Engineering News (ISSN 0009-2347) is published weekly except for the last week in December by the American Chemical Society at 1155—16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices. POSTMASTER: Send address changes to C&EN, Member & Subscriber Services, P.O. Box 3337, Columbus, Ohio 43210. ACS assumes no responsibility for the statements and opinions advanced by the contributors to its publications.

Advertising Management: CENTCOM LTD.
(For list of offices see page 55)
Office of Ombudsman: (800) ACS-5558, No. 5-4
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LETTERS

Find grads jobs—or else

When the effects of industrial pollution on the well-being of our planet were recognized, steps were taken to correct the problems. Chemical firms complied with governmental regulations to protect the environment. In fact, for many chemical firms today, environmental expenditures exceed research budgets.

Why is there not the same concern shown for the preservation of our technical manpower? Unless we take steps to find positions for technical graduates, we will arrest the influx of qualified students into the chemistry major programs of our colleges and universities.

Chemical firms need a continuous supply of creative personnel if they are to develop new products and remain competitive with firms in countries that promote the development of creative problem-solvers. This affects not only the well-being of the company but of our country as well.

The chemical industry should take the initiative before the government establishes a Technical Manpower Protection Agency (analogous to the Environmental Protection Agency) with the concomitant expansion of the bureaucracy.

George J. Beichl
Philadelphia

Entrepreneurs for independence

The economic status of chemists has received much attention in the past few years, as we might expect in a decline. Many suggestions—including certification or licensing, immigration control, and continuing education—were made by Attila Pavlath (C&EN, Dec. 20, 1993, page 45). In another letter (C&EN, Jan. 17, page 2), W. J. Vullo made a case for broadening the basic education for chemists.

I'm very much in favor of broadening the education of chemists, but I would like to do it with a target in mind that will make chemists more independent. I would like to see chemistry departments offer training in entrepreneurship—course work that details just how to get a new venture going. In so doing, the student must consider all aspects of the chemical business, from raising money to environmental concerns to marketing. Such training would be equally valuable in starting a new venture or working for a large corporation. The object is to make the chemist more independent.

As an early example of this approach, Carthage College, Kenosha, Wis., has established a Distinguished Professorship for Entrepreneurial Studies in Sciences.

Paul R. Story
Johnsonville, S.C.

No turning back

I am sitting at a campsite in Grand Teton National Park having read the two letters by Edwin A. Matzner and Frank A. Anderson headed "Science's costs, benefits" (C&EN, June 13, page 4) and remembering Bryan J. Cook's pessimistic letter (May 16, page 5) to which they were responding, indicating that science is the cause of many of our current problems. (The feature article on plutonium disposal problems [C&EN, June 13, page 12] didn't exactly refute Cook.) However, viewing these magnificent mountains, I tend to be optimistic, and I wonder if the discussion doesn't need to be broadened a bit.

Anderson's "four fundamental laws" are excellent and should be universally taught. I hope he won't mind if on occasion they are given additional (attributed) exposure. Unfortunately, his last paragraph essentially calls for abrogation.

Matzner's litany of inescapable scientific achievements is compelling, but does not address the question of their accompanying consequences—to date and forever more. It does, however, provide some evidence that there is a "fifth law": No action is truly reversible. (Note that doing nothing is an action.)

I propose that the problem is not science; it is philosophy (thought, knowledge, perception, whatever). We are creatures of actions with reasons (good, bad, scientific, emotional) rather than reaction by instinct. "*Homo whichever*" started us on this course when making the first tool,

Correction

- Aug. 1, page 6: Operating income from Dow Chemical's hydrocarbon and energy business finished this year's second quarter at $27 million, not $32 million as implied.

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South Africa's Chemical Industry Prepares To Enter Global Market

■ ***Emerging from cocoons of subsidization, firms must address high costs, lack of trained workers, environmental issues***

Patricia L. Layman, C&EN London

The rainbow coalition proclaimed by Nelson Mandela upon his inauguration as President of "new" South Africa marked the official end of the country's status as pariah.

The country is emerging to take its place on the world stage, dismantling trade barriers that have protected its self-sufficiency and insulated it from the heady competitive pressures of world markets. Its businesses and industries, in turn, are emerging from behind protective tariffs and restrictive laws—as well as sanctions imposed by other nations to protest apartheid—only to realize that high costs and inefficient infrastructures must change to ensure survival.

And the chemical industry, as one of the major industries in South Africa, is one of the leaders of that process of change. It has little choice. It is fighting to make a place for South Africa in one of the most international industries—an industry with no time for sentimental largesse for a rainbow country, even one whose transformation to multiracial democracy seems little less than miraculous.

South Africa is a market of about 40 million people, of whom about one sixth are white and the others are black, Asian, and what the country calls "colored"—mixed race. That is undoubtedly an attractive-sized market, but it is small compared with, for example, the more populous countries of southern Asia. India, by one estimate, has a middle class already nearly as large as that of the U.S., and it is expected to double to about 300 million by 2000, fueling demand for consumer goods and services—and chemicals.

Throughout southern Africa, however, growth potential for industry in the near future is quite limited. South Africa should be able to retain its dominance of the region's economy. South Africa's total gross domestic product (GDP) in 1993 was estimated at slightly less than $90 billion. That's more than three times the economies of all other southern African nations—Angola, Zimbabwe, Botswana, Zambia, Tanzania, Namibia, Malawi, Mozambique, Swaziland, and Lesotho—combined.

Within South African industry, the chemical industry continues to be a major contributor. In a study, "An Overview of the South African Chemical Industry 1993/1994," published by Council of Scientific & Industrial Research Information Services (Pretoria), author Colin Cook pegged total manufacturing sales in the country at $55 billion in 1992; of that, about 18% came from the chemical and process industries.

That percentage was slightly lower, he says, than in an earlier report he wrote, when statistics up to 1986 showed that chemicals and allied industries were about one fifth of all manufacturing in terms of value. One of the main reasons for the slip in percentage, he says, is the poor harvests over the past few years, reducing consumption of agrochemicals. In addition, lower levels of mining activity also have affected chemical consumption and production volumes.

Cook says 1992 chemical sales were about $9.32 billion, but that includes total sales of Sasol, the largest company in the sector. Stripping out Sasol's sales of liquid fuels and coal brings the total down to about $7.25 billion in 1992 and just shy of $7.30 billion in 1993.

That figure puts the country's chemical industry on a par with that of Sweden, for example, which had sales of $7.20 billion in 1993. Sweden, however, has a population of only about 9 million people. On the other hand, Poland has a population of 38 million, roughly equivalent to that of South Africa; Poland's chemical industry in 1993 totaled about $5 billion, according to statistics compiled by CEFIC, the European Chemical Industry Council, located in Brussels.

A recent company newsletter at Dutch chemical producer Akzo Nobel notes that "the South African market is unique in its diversity. Marketing efforts have to be directed to English, Afrikaaner, Asian, and 16 African tribes, all with different languages and cultures. Distances between towns are enormous—for example, the distance between Cape Town and Johannesburg is [about 1,000 miles]. However, the road, rail, and air networks are excellent."

In fact, the country's spaciousness has probably helped contribute to its chemical industry's earlier comfort within its own borders. Ian van Schalkwyk, manager for the industrial chemicals unit of Hoechst South Africa, a subsidiary of Germany's Hoechst, put it this way: "The history of the industry here has been of restrictive trade practices: government subsidization and isolation from competition. Most of the technology is dated, and plants are small, inward-looking, for serving local demand."

One result has been that the industry has suffered "a significant decrease in real sales growth" in recent years, says van Schalkwyk. Between 1973 and 1980, average annual real growth of chemical sales was 8.8%, which fell to 4.5% per year in the period 1980–85, and declined at an average annual rate of 1.8% between 1985 and 1990.

"We've had decades of import replacement and were more protected than was desirable," agrees John Job, managing director of Sentrachem, South Africa's second largest chemical company. That policy, in turn, shaped the industry, promoting the development of four major companies—AECI, Sentrachem, Hoechst South Africa, and Sasol.

Zebras and antelopes graze near Sasol plant at Secunda, South Africa.

Those four firms accounted for more than 40% of the chemical sales in 1993; by contrast, more than 300 small- and medium-sized companies accounted for only 35%. The rest of the sales came from the 15 to 20 multinational companies operating in South Africa.

Tariff protection

One of the major ways in which South African industry has been sheltered has been in tariff protection, as well as tightly controlled limits on some items. The government thought such import restrictions "would lead to development, but they didn't," observes H. W. E. Schmidt, manager of market intelligence and special projects at Hoechst South Africa.

Instead it led to plants sufficient for local demand but not for international competition, with high unit costs and sales prices. That was acceptable under the circumstances. If imports coming in were threatening local industries, the tariffs were raised. It was a cozy situation, one which benefited the supplier but certainly not the customer. According to one purchasing agent, the general attitude of chemical companies was, "Either you buy the product or not, we don't care." And producers did not need to look at exports, because domestic markets took all their production.

With the signing by the South African government of international trade policies set by the General Agreement on Tariffs & Trade (GATT), there will be substantial changes, Schmidt says. "The real world will be happening for the South African chemical industry."

South African tariffs on all products will be reduced over a period of years from an average of 21% to an average of 15% across the board, and tariff headings will be reduced from the more than 100 currently to six. According to Schmidt, more products will be grouped under one heading, with tariffs reduced or eliminated. However, some products may be put in a tariff group for the first time and thus have tariffs applied. Ironically, many of the chemicals imported by the industry will be among those with new tariffs.

According to the World Bank, South African tariffs have been about average for a developing country, although they are considered to be very high by industrialized nation standards. Additionally, the dispersion, complexity, and instability of the system have undermined economic efficiency. The net effect has been a heavy bias against exports, two thirds of which stem from the higher input prices that industry must pay for raw materials. The South African Chamber of Business has estimated that manufacturing costs are 15% above the average for countries of the Organization for Economic Cooperation & Development (OECD), because companies pay 25% more for their raw materials than their competitors in industrialized countries, and because capital costs and labor costs, adjusted for productivity, are higher.

The industry's success will all come down to the question of competitiveness, argues Vincent Lovell, executive director of Sentrachem, and to a great extent that depends upon the relationship between government, labor, and capital.

"We must ensure that these [entities] work together, not as antagonists," he says. "Government must not be too interfering, industry not collusive, and labor not [demanding of] too-high wages. We must have the right balance."

Competitiveness components

Lovell sees a number of components to competitiveness—including raw materials, technology, logistics, market accessibility, and fixed costs. As for raw materials, South Africa has minerals and coal, agricultural products, and off-shore petroleum. The country still has single-channel marketing boards from the old "seige economy" days; this must change, Lovell says, and the industry must create high-value markets by product differentiation.

The country's technology, he says, is mainly imported. This has limited importance in commodities but is vital in spe-

Restructuring changes the landscape at AECI

AECI, the largest chemical company in South Africa, posted sales in 1993 of $1.61 billion, up 8% over 1992. Operating profits also increased 8% to $126 million, and net profits, before a nonrecurring gain, were up 26% for the year to $56 million.

The first half of this year, however, has shown the initial effects of major joint ventures established and reorganization measures completed in 1993. Sales for the first half were $672 million, down 11% from last year's first half, as the company's accounts reflected loss of sales of polymers now in Polifin, a joint venture with Sasol, and of explosives, assigned to a joint venture with ICI.

But net profits, before nonrecurring gains, of $22 million for the half showed substantial improvement, up 34% from the year-earlier figure.

For chairman Michael Sander, the need of South African industry to meet a growing international challenge has become one of the major forces shaping the chemical industry—and AECI. As he notes, "For South Africa to succeed, we [the country] have to achieve a growth rate of more than 5% per year. We can't do that just on our domestic market. Most of us [in manufacturing] now are looking at external markets."

In fact, for AECI, he adds, the test for investment in business areas is simple: "Can we make money in exports with this product? If not, we won't invest in it. It's a tough criterion, but the only sane one."

The philosophy, Sander adds, has paid off as the political changes have occurred in South Africa over the past several years. "Our response to the change has not been instant, but we began changing our mind-set. We began funding R&D that is beginning to pay off now."

AECI at a glance

Headquarters: Johannesburg

Sales: $1.61 billion in 1993

Operating profit: $126 million in 1993

Net profit: $56 million (before nonrecurring gain) in 1993

Major product areas: Organic chemicals; paints and coatings; fertilizers and animal feeds; resins and nylon fibers, including tire cord; plastic products, including acrylic and urethane automotive parts and construction products

Joint-venture areas: Hydrogen peroxide, detergent-grade sodium tripolyphosphate, formaldehyde and urea-formaldehyde resins, aluminum sulfate, soda ash, titanium dioxide, explosives, chlor-alkali, polyvinyl chloride, and polyethylene

The compelling need to compete on an international level did spur the company's two major restructuring moves last year: formation of an olefins and polymers joint venture with fellow South African industrial giant Sasol, and swapping AECI's explosives business to ICI in return for 25% of ICI's 39% shareholding.

"We had been very close to another joint venture with Sasol earlier, but couldn't quite do it," recalls Sander. "The logic wasn't as strong. This time, the conviction grew in our minds: To be competitive in petrochemicals, you must have competitive feedstocks, with cash costs as low as the most aggressive in the world. Sasol is there," with its olefins-from-coal supplies.

The company is also considering new acetylene technology. "Our aim is to make acetylene as cheaply as ethylene. It's a very valuable raw material; it's just too expensive right now. It's one of those projects that should be looked at carefully before it is discarded out of hand."

At the top of the list of potential new areas for AECI is the biochemical industry. "It is in its early days now, so there is a better chance to become active in [the industry] without being wiped out by the international giants." Sander continues, "We think we have jolly attractive feedstocks—sugar and maize—for biological fermentation. We already are in nutrition, with commodity products such as vitamins and phosphates." The company is well under way, for example, with construction of a plant to make lysine from sugar industry byproducts, using its own fermentation technology. The plant is expected to be on stream in mid-1995.

In commodity areas, the company is dogged by the current state of the soda ash market, which is the source of the red ink plaguing Soda Ash Botswana, a joint venture in neighboring Botswana in which AECI owns 25%. "There is nothing wrong with the project; the timing is wrong," Sander insists. "When we built the plant, the market was 750 million lb per year. Now it is 507 million lb, and world prices are low.

"In due course, the market will return, and the prices will go back to normal. For now, we grit our teeth. But it was an important project. It was conceived and done when things were not terribly encouraging in South Africa. And it was done on a regional basis: It wasn't just South Africa versus the rest of Africa."

cialties. "We must concentrate on niche specialty chemicals." Its markets, he says, consist of small domestic and regional trade blocs and are characterized by geographic isolation. "We must globalize."

And as for fixed costs, he points out tremendous changes during the past two years. The tax rate has come down from 47% to 43%; inflation has also declined. As time goes on, these rates should improve, Lovell says. However, low productivity is the big problem: South African workers' educational and skills levels are significantly lower than those of competitors. "Education and training are the answer, but that is easier said than done."

The whole situation, he adds, is "particularly challenging in a relatively small economy. If you want to compete, you must compete on a world scale, for world markets. We have to go down the value-added chain, be more in specialty chemicals, and work those niches better than we have been."

Many of the same ideas are expressed by Michael Sander, chairman of AECI, the largest chemical producer in South Africa. "For the manufacturing industry in general," he asks, "what's the best thing for our country? To expand substantially our manufacturing sector, by adding value. What is the best way to do that? It must be to bring technologies and good practices to this country, and to encourage and make space for the products made here.

"GATT changes, on the whole, will be good," he adds. "We will have to

become more competitive. There will be a need for a lot of help to get production up to world standards. Where I would like to see [President Bill] Clinton put his money is in education, helping us that way. We have a tremendous amount of catching up to do."

As for the chemical industry, says Sander, "the opportunity to trade internationally has been with us for sometime. Sanctions fell away a while ago. We are regaining positions in export markets. Business has been quite depressed, but, during a difficult time, we have regained quite a lot. I'm pretty optimistic that we will have a good second half, and 1995 has the hallmarks of being a good year. Business is okay—for the first time in quite a few years, really. We've had a hard time, and as the barriers come down, we'll recover rapidly.

"We had to learn to be competitive," Sander adds. One way in which AECI addressed the subject was to form a joint venture in monomers and polymers with Sasol. The resulting venture, Polifin, is considered a world-scale competitor, more than able to hold its own among petrochemical giants around the world.

That was a sensible course of action, says Ronnie Hampel, chief executive officer of Britain's ICI, which until last year held 39% of AECI. "My general view is that South Africa has a strong domestic economy, some high-quality businesses, and a strong raw materials position. It has to adjust to the world competitive scene, subject to world competitive pressures," Hampel says.

"As we have been exiting from commodities and petrochemicals elsewhere in the world, it seemed sensible to exit petrochemicals in South Africa, from AECI." Hence the company cut back its shareholding to 13% in exchange for a 51% stake in AECI's explosives business. But in the course of that deal, Hampel notes, "we were instrumental in the deal between AECI and Sasol—it has to be world competitive."

Sander points out that "this has been an inward-facing industry. Exports were opportunistic. It was a rare company that invested for export opportunities, before. Now with the flick of a switch, and GATT nearly final, sanctions have dropped and financial and markets access are open. We have lots more competition from outside. You have to respond; you have to export. If your market share in your own market goes down, you have to look at other people's markets."

Indeed, "exports" seems to have taken on the air of a rather determined mantra in the industry. Sentrachem's Job, for instance, emphasizes exports along with increasing internationalization for the company. "I'm confident about what South Africa can achieve and what the chemical industry can achieve," he says. "I hope in our move into those overcrowded world markets we will find collaborative opportunities and not have to cut and thrust every step of the way, but we will if we have to. Defense is never a sufficient strategy; defending strong small markets that are no longer protected is not an adequate strategy. We're at a crossroads now, not only for the country, but also for the industry."

However, he also points out that internationalization is a two-edged sword. One edge benefits the company, the other penalizes it as former opportunities are closed by wary competitors.

That is particularly true, he says, with R&D. "The old way of going and buying technology almost always has a tight geographic constraint on where you can sell the product," he says. "If you're going to export and sell more internationally, it will be more difficult to get licenses. We've already run into a couple of examples of that.

"In those areas, you have to be more self-sufficient in technology. People just won't sell licenses other than in standard lines where it is almost commodity technology. If you want anything more differentiated, you have to do it more yourself." Companies will protect their interests by holding more closely to intellectual property, now that GATT is limiting the financial means of protecting themselves, Job suggests.

Important chemical-producing sites are located in several cities

Key: ●Chemically important cities ■ Other major cities

Four companies dominate the chemical industry

Millions	Sales, 1993
AECI	$1,613
Sentrachem	709
Hoechst South Africa	378[a]
Sasol Chemical	335[a]
SUBTOTAL	$3,035
Other top 15 to 20 multinational firms	1,684
Medium-sized 10 to 15 domestic producers	950
Roughly 300 small- to medium-sized domestic producers	1,630
TOTAL	$7,299

a Estimated. **Sources:** CSIR Information Services, C&EN estimates

Developing a country

The chemical industry may be gearing up to increase exports and international operations, but it will also be keeping a close eye on the implementation of President Mandela's reconstruction and development program, by which he has pledged to reshape South Africa.

The country has tremendous variations in development throughout its nine provinces, established earlier this year from the former five. Western Cape Province, around Cape Town, is the most highly developed, with the highest disposable income per capita and the most education beyond primary school. However, according to a study by the Development Bank of Southern Africa, the average income per capita for blacks is highest in the Pretoria-Witwatersrand-Vereeniging Province, around Johannesburg, at $2,534 per year, compared with the $417 in the Northern Transvaal Province, in the northeast region of the country.

One can also see such contrasts in the black townships themselves. For exam-

Individual units thrive at 'central' Sentrachem

Sentrachem, the second largest chemical company in South Africa, had sales in 1993 of $709 million, up 8% over 1992. Net profits, at $24 million, showed even more improvement, up 21% over 1992, despite increased exposure of the South African economy to international competition and depressed growth in the domestic market owing partly to continued violence.

With the 1994 elections and the new government, however, the economic picture is stabilizing, says managing director John Job. Now, in fact, he says, "actual business conditions are not bad. They are not brilliant, but not bad. I'm feeling fairly relaxed and looking forward to better things."

As the industry has come through the past few "stringent" years, he adds, Sentrachem and other companies have come "to grips with their inefficiencies." The basic result: Sentrachem is closing down some businesses that were successful in the old order and starting new ones that will be relevant for the new economic order in South Africa.

Such closing and starting is perhaps easier for Sentrachem than it would be for many other companies because of the nature of its structure—a collection of various chemical units pulled together into one company. That, in fact, is the source of the name Sentrachem—derived from the Afrikaans term that means pulling to the center. The company was formed in 1967 as an agglomeration of several smaller firms.

"That is paradoxical," says Job, "because we've continued to respect the approach of having individual companies. We are almost a business federation, but generally in chemicals."

That structure, he says, gives the company a built-in flexibility to meet customer needs. On the other hand, in the years shortly after the company was formed, "collective strength" proved a seductive, but dangerous, notion. Sentrachem was lured into launching a series of substantial investments, some of which went seriously wrong. By the time company management began to sort out the investments during the mid-1980s, the company was "really in a survival mode," Job says.

"That's where we were 10 years ago," he admits. From there, the firm "ran an intermediate phase. Having survived, we had to reconstitute ourselves." That led to an investment program of roughly $450 million from the late 1980s through the early 1990s to build up a major asset base.

The main focus for the company now is balancing a few selected commodities and an increasing selection of high-value-added products. At Sentrachem, "We're not going to exit commodities or deliberately scuttle them. But those activities will be more inactive in international markets. They won't give us the boost into the international marketplace," on which he is putting strong emphasis. Sentrachem saw a 29% rise in exports in 1993; exports constituted 13% of group sales. Job says the company's goal is to boost exports to 25% of sales over the next three to four years—or sooner.

In fact, he adds, Sentrachem will be focusing its investments on areas where it can "export effectively and profitably." That, he suggests, inevitably leads to "greater concentration of efforts in more sophisticated areas—adding value, conducting chemicals processes, and providing quality and service to match our products. As we go forward, we may well change our portfolio, but it's pretty neat now."

The "center" of Sentrachem "provides the guidance," Job says. "We are more than a holding company; we are chemical industry boffs"—experts. "We may add and subtract from these divisions, and as time goes by, we will. We don't, for example, rely solely on the divisions to find their own acquisitions or products to go into; we have our own ideas as well.

"Quite a bit of my time now," Job adds, "is spent in identifying and creating those opportunities" for mergers and acquisitions, particularly those taking Sentrachem into manufacturing in other parts of the world.

The company already has some 13 joint ventures, primary among them is Safripol, a 50-50 joint venture to make polymers with Hoechst that was formed 20 years ago, and a new one with Sasol, to make alkylamines.

The possibility of forming international ventures is important, says Job, because "what we believe is that Sentrachem is competent in joint ventures. We know what [the partners] require and how to manage them, as one side of the partnership. That is very acceptable as a way forward worldwide."

Sentrachem at a glance

Headquarters: Sandton, suburb of Johannesburg

Sales: $709 million in 1993

Operating profit: $57 million in 1993

Net profit: $24 million (before nonrecurring charges) in 1993

Divisions and major products: Agrihold/Sanachem—agrochemical production and distribution; Karbochem—synthetic rubber, processing and mining chemicals; NCP—organic chemicals (including ethanol), water purification compounds, enzymes, and chlorine, caustic soda, and specialty derivatives (including swimming pool sanitizers),; Mega Plastics—plastics products, including containers, tubing, automotive components, and insulation; Chemical Syndicate—unsaturated polyester resins

ple, the largest township, Soweto—South West Township—is a collection of some 30 communities ranging from what is called "Beverly Hills," complete with Maseratis behind iron gates to small neat houses, many with lovingly tended flower gardens by the door, to squalid squatter camps.

Soweto, like most of the townships, started when gold mines were still worked around Johannesburg. The mining companies needed labor for the factories serving the mines. Black workers originally lived in the west part of Johannesburg, sharing land with whites. Then land acts shifted them to separate areas in the south, and these communities have grown ever since.

Official statistics include Soweto as part of the population of greater Johannesburg: 596,000 out of a total of 1.9 million. Sowetans, on the other hand, say their population is more than 3.5 million—an illustration of the difficulty in pinning down a community in flux. The township's 30-odd communities occupy 47 sq miles, have 369 schools, one uni-

versity (opened in 1982), one teachers' training college, and one hospital—the largest in South Africa—which treats 1.3 million patients each year.

The township also has an unemployment rate of at least 40%. Most of the population growth comes from an influx of people from outside the area, because more and more long-time residents are limiting their families. Says one bus driver in Soweto: "I'm having only two children, so they can get a better education. I don't want them to be tour guides—the Minister of Tourism, perhaps!"

Health, housing, and education are among the top priorities for the reconstruction and development program—areas in which the chemical industry can make significant contributions with pharmaceuticals and materials, for example, points out Hoechst's managing director Reinhard Traub.

The African National Congress' (ANC) political platform called for raising the health budget from 3.4% of GDP to 4%—roughly $3.6 billion to be spent over five years—to create a single integrated national health care system based on primary health care and funded mainly through existing taxation.

This was partly addressed by the budget prepared by Mandela and his Cabinet earlier in June—"sin taxes" included excise on cigarettes raised by 25%, and on some beer types by as much as 33%. These tax-derived monies augment funds shifted from other government departments, such as defense.

In other areas, the country's minister for water affairs and forestry, Kader Asmal, aims to create a national water and sanitation program that would help all households to secure a clean and safe daily water supply of 5 to 7 gal per person within a distance of 200 yards of their homes. The new policy has been developed to combat the situation that was created under apartheid, when more than 12 million people did not have access to clean drinking water, and 21 million did not have proper sanitation and refuse removal.

And on yet another front—housing—national housing minister Joe Slovo has committed the government to building 1 million housing units within the next five years.

For every $270,000 invested in housing, Slovo says, 120 jobs are created. That is five times better, he notes, than the employment benefit of investing in textiles, for example. Housing also creates a consumer market for electrical goods and leads to development of roads and water systems.

C&EN staff photos

Government goal is to provide houses like those in Soweto (right) for people now living in squatters' towns (above).

Slovo's program takes in a research project by consulting agency CSIR to test different building methods for housing. The buildings that have been tested are made from materials ranging from pressed grass cuttings to steel. One prototype from the refrigeration industry used a polystyrene core inside of steel walls; another used cardboard impregnated with resin—which people didn't like because of the hollow sound it gave off. The pressed straw began to sprout grass, although it was suitable in other ways.

Whatever materials are selected, there will probably be no one style. Local materials will be important. Communities near lumber mills will build timber-frame houses, and those near steel plants, houses with pressed-steel walls and roofs. Hollow concrete blocks will probably also be widely used. And although roofs could be anything from glass-reinforced plastic to thatch, metal sheeting and cement tiles appeared to be the most popular choices among the CSIR prototypes.

Unskilled labor force

The lack of skilled workers will be one potential control on economic growth, government analysts and private-sector economists agree. According to AECI's Sander, experienced, qualified blacks are in great demand now in South Africa.

That assessment is backed up by recent studies by South African consultants who indicate that companies are prepared to pay black senior managers up to 50% more than their white counterparts.

Says Sander, "We've put a lot of time and money into developing our people, only to lose many of them to other companies. But then, as a leading company, you have a responsibility to develop people for the whole country."

He supports the idea of an industry training board; responsibilities for training employees should be unilateral, he says. "The number of people in the country qualifying with sufficiently good grades in math and science is woefully small—of whatever race. When the economy picks up, we will be massively short of people. We will have unemployment and shortages of the people who are needed—a contradiction."

One result of a shortage of educational and occupational skills is an emphasis among chemical companies on training their people—and, in some cases, their customers.

For example, for almost seven years,

Self-sufficiency reigns at Hoechst South Africa

As the third largest chemical company in South Africa, Hoechst South Africa is well on its way to topping $400 million in sales this year. The subsidiary of German chemical giant Hoechst passed $270 million in sales in 1991, but these figures expressed in South African rands provide more meaningful progress markers: 1 billion rands in 1991, 1.5 billion in 1994.

And what makes that performance particularly noteworthy, according to managing director Reinhard Traub, is that almost 90% of sales came from local production. "This proportion of locally produced sales is far higher than that of Hoechst locations in the U.S. and Europe," he points out. Hoechst U.K., for example, domestically produces only about 50% of its sales.

Moreover, although plastics in various forms and grades account for 43% of sales, he adds, "We are probably the most diversified chemical company in South Africa." The product slate varies widely, from biaxially oriented polypropylene film to veterinary pharmaceuticals to pigment preparations. Hoechst also conducts pharmaceutical and agrochemical R&D in the country.

As Traub sees it, a broad product range will be needed by chemical companies working to serve a country like South Africa, which in part is very underdeveloped.

"Given the discrepancies in population and wealth, meeting the basic needs of people will require a much greater emphasis on the provision of clothing, food, housing, health care, and education," Traub says. The company plays a strong direct role in the first four categories.

And in the area of education, the company's Social Responsibility program comes into play. This is a multifaceted program that extends from children's education to helping in the formation of and ongoing support for small businesses run by black entrepreneurs.

Among the facets of Hoechst's Social Responsibility program are the following:

- Support for black teachers to upgrade their qualifications.
- Extra lessons at schools for employees' children to help prepare for year-end exams and for the equivalent of high school graduation; and a primary school for children of employees at Hoechst's research farm in the northeast of the country, which is also open to other local children.
- Scholarships for employees' children to enable them to have post high school education.
- Business development services to assist promising black entrepreneurs in setting up their own small factories to produce detergents, cosmetics, car care products, and other household products.

The Business Development Services unit was set up by Hoechst seven years ago, in part to help train a pool of black entrepreneurs with interest in chemical businesses. There was a very limited supply of such people, primarily because—until 1979—blacks were not allowed to run their own chemical manufacturing businesses in South Africa.

Hoechst provides an assistance package to the startup businesses, including raw materials, marketing assistance, business skills training, and followup consultation. In some cases, Hoechst is a customer for the products that have been manufactured.

Bernard Magabe, who is responsible for Hoechst's small business initiative, oversees the program. He also supervises young university graduates taken on by the small enterprises as part of the program's arrangement. These graduates are usually chemists and technicians who can put their education to work by formulating paints, adhesives, and other consumer products, for example, while acquiring business skills.

They also acquire the Hoechst "culture"—safety and environmental awareness, for example—that will stay with them when they join Hoechst at the end of their business internship with the entrepreneurs. According to Magabe, some 30 people have gone through the program.

Hoechst South Africa at a glance

Headquarters: Midrand, suburb of Johannesburg

Sales: $378 million (estimate) in 1993

Major sites and products: Chamdor, near Johannesburg—pigment preparations, polyvinyl alcohol (PVA) dispersions, polyphosphoric acid, polypropylene film; Cape Town—polyester staple fiber; Durban—textile auxiliaries, PVA dispersions, veterinary products, polyester staple fiber; Pretoria—pharmaceuticals, fine and pharmaceutical chemicals, toiletries and cosmetics

Hoechst has had a business development program to develop entrepreneurial skills among black owners of small companies in chemical specialties or in distribution and product handling. When Hoechst moved to new headquarters outside Johannesburg in May 1991, it sold its former head office site and buildings in the city to the government-sponsored Small Business Development Corp. (SBDC). Hoechst, as part of the deal, bought an equity share in SBDC. Under the arrangement, the buildings on the site were converted to provide premises, services, and training for small business entrepreneurs.

Sentrachem runs two projects in training and education. One, Sentravision Bridging School at its Sentrachem Gardens headquarters, opened last year. The school has 12 students who are improving their science and math grades and working toward high school graduation. In the other project, in collaboration with the science faculty at the University of the Witwatersrand, Johannesburg, Sentrachem sponsors a multimedia science education program for high school pupils.

Sentrachem's Lovell says: "Since the 1970s, we have had great success in teaching people single skills. Now, we need to teach multiple skills. Just to do one job is not sufficient—you have to do a number of jobs. The concept is one of the important things we've got to teach."

Role of labor unions

Whether that concept will be welcomed by South Africa's unions, however, is another question. As has been noted by a variety of observers, one of South Africa's problems is that it has a labor force dominated by a small group of unionized black workers who have relatively high wages and secure jobs and who have effectively priced South Africa out of competition with the

emerging economies of Asia and Latin America.

Unions in South Africa have 3.5 million members, or about one fourth of the economically active population. COSATU—the Congress of South African Trade Unions that was founded in 1985—has 1.3 million members, more than half of whom earn less than $300 a month.

This year has already seen the most industrial action since 1991, and with workers demanding substantial wage increases in the current round of negotiations, more major strikes are possible.

Labor observers figure that the newly aggressive attitude reflects raised expectations resulting from the economy's return to growth after a four-year recession and the belief that the new government will be much more sympathetic to wage demands than its white-led predecessor.

Government subsidies

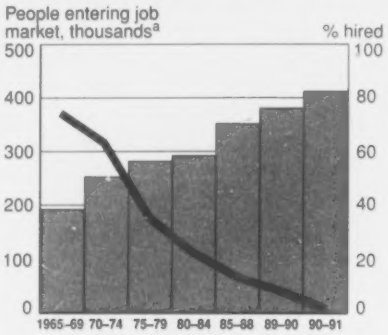
Just as labor unions are trying to work out their relationships with the ANC, now that it has become the party of power, the chemical industry is watching for signals concerning the government's relationship with the fuels and raw materials side of their business.

The government is currently wrestling with how to restructure its protection of the petroleum industry and whether it should offer any protection at all. Both Sasol and the relatively new Mossgas project, which has licensed Sasol's Synthol process for forming liquid fuels, are entitled to substantial protection. The government sets a support price for barrel equivalents, and if the market price of crude falls below that, the government pays the difference to Sasol and Mossgas. The support price just negotiated is $21.10 per bbl of oil; the current spot price for crude oil is about $17.50 per bbl.

What will happen to the entire support program is unclear. For example, President Mandela says he wants the industry to be on a break-even basis, but according to some sources, the new minister of energy is "making noises about wanting to expand" the program.

Until Mandela's ministers decide on any changes, however, Mossgas and Sasol will receive what a Sasol official sees as tariff protection for the synthetic fuels industry, but which all other industry observers and analysts consider a "subsidy."

Job creation is urgently needed in the new South Africa



a Average of yearly numbers for formal employment.
Source: Hoechst South Africa

Perhaps in the worry that the support required for the Mossgas project has pushed what cynically could be seen as a good thing over the edge of acceptability, there is little love lost between Sasol and Mossgas.

"We don't participate in the Mossgas project," a Sasol executive says firmly. "We had to sell our technology to Mossgas—the government demanded it. They have the technology now for processing [natural gas into liquid fuels]. We don't believe it's a viable operation. We're waiting to see what the new government does—Mossgass is very costly to run, and [it is] not cost-effective."

In fact, says one financial analyst in Johannesburg, "Mossgas will never earn a penny. The government was hoping the gas field would be better than it has turned out to be. The project would never have been undertaken on an economic base."

Sasol's Synthol process can be fed either with natural gas or with synthesis gas (a mixture of carbon monoxide and hydrogen) derived from coal gasification. At Sasol's coal gasification plants at Sasolburg and Secunda, low-grade coal is gasified in the presence of oxygen and steam to produce synthesis gas.

As the company describes the process, in the course of coal gasification using Lurgi technology and the purification of the resulting synthesis gas, various chemicals are produced—including cresols, some ammonia, and sulfur—all of which are marketed by the company or used in making fertilizers and explosives.

The purified synthesis gas goes through either of two versions of Fischer-Tropsch hydrocarbon synthesis, passing the gas over iron-based catalysts. The large fuel-synthesis plants at Secunda employ high-temperature technology and yield the equivalent of 120,000 bbl of crude per day. Sasol has now commercialized a fixed fluidized-bed Synthol reactor, which features lower capital costs as well as lower operating costs.

On the other hand, according to Sasol data, Mossgas was decided upon in 1987 and commissioned in 1992, when there was a decline in world oil consumption and growth rates. The price of oil had also dropped, from $28 per bbl to $12. The payback period, Sasol predicts, will be 36.9 years for the project, built to develop the natural gas

C&EN staff photo

Hoechst South Africa helps small enterprises like Shap Chemicals get set up and operating.

Coal and its gasification support chemicals growth at Sasol

Sasol, the South African Coal, Oil & Gas Corp., established in 1950, is synonymous with South African chemical industry. Its coal gasification and Fischer-Tropsch synthetic fuel production are almost legendary.

However, although Sasol, as an energy company, is one of the larger industrial companies in South Africa, it is only the fourth largest chemical company in South Africa. The firm breaks out chemical operating profits—for fiscal 1993 they were down 34% from the previous year—but does not indicate chemical sales, which are estimated at $335 million for fiscal 1993 compared with an estimated $319 million for the year earlier.

Results for the fiscal year ending June 30, 1994, will not be released until early September. However, results from the first half, which ended Dec. 25, 1993, showed that operating profits for the company as a whole were $300 million, up from $222 million in the comparable period a year earlier. Investments in petrochemicals helped lift operating profit margins, says Sasol managing director Paul Kruger. Net profits were $189 million, up 16%. Sales in the half year for the corporation were $1.26 billion, up from $1.17 billion in the previous year's first half.

"At the base of the whole gigantic pyramid of Sasol's synthetic operations," points out Kruger, is coal and its gasification. Three gasification plants have been built. The original one, built at Sasolburg in the early 1950s, has just been renovated—at a cost of nearly $220 million—to serve strictly as a chemical products plant. The other two, at Secunda, are synfuel plants, supplying both feedstocks to the chemical industry and refined fuels to the motor industry.

Sasol at a glance

Headquarters: Johannesburg

Sales: $2.23 billion in 1993 (fiscal year ended June 30, 1993), of which about $335 million was in chemicals

Net profits: $353 million in 1993

Chemical operating profit: $62 million in 1993

Major divisions: Established as wholly owned subsidiaries, operating at arms' length

Sasol Synthetic Fuels—Owns and operates two coal gasification plants, at Secunda, to produce synthetic fuel

Sasol Oil—Controls output from Natref refinery at Sasolburg, plus purchased synthetic fuels; supplies 50% of total South African market for gasoline and other motor fuels

Sasol Mining—Produces 33.4 million metric tons of coal per year from mines at Secunda and 6.8 million metric tons from mines at Sasolburg

Sasol Technology—Provides in-house R&D engineering, process technology, and technology transfer

Sasol Chemical Industries—Owns and operates Sasolburg chemical products complex and other plants; products include waxes, solvents, α-olefins, fertilizers, mining explosives, and candles; joint ventures established in monomers and polymers, in acrylic fibers, and in alkylamines

Part of Sasol's strategy development has been to determine an appropriate balance between the supply of chemicals and that of fuel. Sasol is using high-value petrochemicals to produce low-value liquid fuels. The result is a new drive to add more value to its stream of intermediates through extracting and marketing petrochemicals, although oil from coal will continue to be Sasol's major business.

According to Kruger, the company's synfuels operations "provide an economic platform covering a high proportion of costs." Take ethylene, for example: "It is far cheaper to extract ethylene from the synthetic process stream, as Sasol already does, than to build a cracking plant to produce ethylene from components of crude oil such as naphtha."

The company is currently investigating projects totaling some $550 million, "the majority of which is earmarked for high-value chemical production," says a Sasol official, and the company expects to spend the money over the next three to five years. Current projects to fuel Sasol's expansion in downstream markets include acrylonitrile and acrylic fibers; alkylamines for explosives via a joint venture with Sentrachem; α-olefins, particularly hexene-1 and pentene-1; and Fischer-Tropsch hydrocarbon waxes.

Among the possible new areas are acetic acid via acid by-product recovered from its Synthol reaction. Sasol believes it has worked out a solvent system to remove the acetic acid, present at less than 1% in the waste stream. The company has built a pilot plant to develop the technology further and hopes to decide on commercialization by the end of 1994.

fields off Mossel Bay on the southern cape coast.

Development of natural gas fields in southern Africa is ongoing, however, both on land and offshore. For example, in April, Sasol and Empresa Nacional de Hidrocarbonetos de Mocambique (ENH), which are jointly promoting the Mozambique-South African Pande gas project, announced that they had approached a number of gas pipeline companies to determine their interest in the project. They indicated that the potential participant will be selected near the end of this year.

Samples show that the gas in the field is dry—high in methane with no sulfur. Eleven exploration wells have been drilled so far, yielding indicated reserves of 2.4 trillion cu ft, of which 1.7 trillion cu ft should be recoverable. South Africa is one of the world's largest economies without access to major supplies of natural gas.

To put the find in context, according to the British Petroleum Statistical Review of World Energy, Algeria's proven reserves are 128 trillion cu ft; Libya's are 45.8 trillion cu ft; Nigeria's, 120 trillion cu ft; and Gabon's, 0.5 trillion cu ft.

Geologists are currently conducting a seismic survey off the Namibian coast, and another off Mossel Bay. All drilling in South African waters up to now has been by the government agency SOEKOR. But that is changing, believes Godfrey Needham, towage and salvage manager for specialty marine services company Pentow Marine, Cape Town, with the possibility that concessions will be opened to outsiders. Namibia has already done that, he points out, and has

already received inquiries from oil companies such as Norsk Hydro and Chevron. If exploration is done by private-sector organizations, the sense is that it will be done more efficiently and more thoroughly.

Meanwhile, Sasol is working to expand its businesses internationally. For example, it is seeking the opportunity to license or sell technology to regions with low-cost natural gas reserves—into the Middle East and Southeast Asia, for example. And it is working to interest China—the other major coal-dependent country in the world—in its coal gasification technology.

Sasol's ethylene supplies are now part of Polifin, the 60-40 joint venture with AECI. "Sasol has a contractual commitment to supply all of its raw C_2 and C_3 compounds to its 60% subsidiary Polifin. Polifin owns the plants for cracking and purifying these streams," explains Derek Lake, Polifin's business optimization manager.

The sight of all of Sasol's ethylene going into the hands of a competing polymers producer raised protests from Safripol—a joint venture to produce various polymers—and its two owners, Sentrachem and Hoechst South Africa, to the country's Competition Board. They argued that there would be a concentration of suppliers and were concerned over source of supply.

"There was indeed intervention by the Competition Board in the formation of the Polifin joint venture," says Lake. "Sentrachem claimed that Polifin would result in a reduction in competition. This is not true, as South Africa still has the same number of low-density polyethylene, linear low-density polyethylene, high-density polyethylene, polypropylene, and polyvinyl chloride producers that existed before the joint venture was formed." Sentrachem further claimed that it would be disadvantaged on ethylene and propylene supply, opposite internal consumers within Polifin.

The Competition Board ruled in favor of Polifin, provided that Safripol would not be disadvantaged. "Polifin has nearly completed contractual negotiations with Safripol for ethylene and propylene supply," Lake adds. "The ethylene contract is probably more favorable than the one that Sasol was planning to renegotiate with Safripol before the advent of Polifin, and therefore Safripol is not disadvantaged. Safripol imports propylene and also purchases a quantity from Polifin. The Polifin pricing will be set to match Sentrachem's alternative price. Polifin has almost completed the propylene supply contractual negotiations."

Students at Sentravision Bridging School improve their math and science skills.

The ethylene supply situation appears to be under control now, but there is widespread concern that several years from now ethylene will be in short supply unless Sasol, or another producer, decides to invest in more capacity, probably by the end of the decade. However, most analysts agree that the South African market is too small for major petrochemical projects.

Less-than-expected gas reserves of Mossgas rule out the idea of a gas cracker at Mossel Bay based on locally available gas, according to Sentrachem's Job. "In the long term, South Africa will need a new ethylene source, and Sentrachem will continue to explore opportunities toward this goal, but at a lower activity level," he says in the company's 1993 annual report.

"South Africa is running out of ethylene," Job emphasizes. "That begs the question: Where and how to get more. A cracker? We don't want to just stop polyethylene production because we ran out of ethylene. But crackers are huge investments. You start to think of partnerships, the Republic of South Africa Inc., different ways you can compete internationally. In the late 1980s, the petrochemical world was booming, but [capacity utilization] is currently low. I am not sure what the answer will be."

Pollution and coal dependence

Until South Africa gains adequate supplies of natural gas, enough to fuel heating and cooking as well as petrochemicals, the country will continue to rely on coal. According to the BP energy review, some 78% of South Africa's primary energy comes from coal. Only China is close to that dependence, with 76%.

And given the South African topography, climate, and growing population around metropolitan centers, the coal burning produces the most noticeable environmental effects: a distinct brimstone smell that accompanies the smog around Johannesburg, in particular, in winter mornings and evenings.

"The new government has a million top priorities," comments Sentrachem's Lovell. "It won't do all it wants to do without all sorts of help—perhaps from a wealth tax, and so on. But how much of that will be earmarked for the environment? I would surmise a very limited amount.

"Where there is no electrification, people are still burning solid fuels. You won't solve that pall over the cities until you solve electrification, for example. It won't happen overnight.

"ANC policy has been calling for a much more disciplined environmental approach," Lovell adds. "We have set standards of emission control that we think are right and which in many areas are much tighter than legal requirements. We are doing things to satisfy the public. The public's perception is what counts."

Hoechst's Traub holds similar views. If nothing else, he says, the pressure is growing because of television and the mass media. For example, South African television news programs have been reporting on the consequences of exposure to mercury and other such hazards.

Mercury industrial waste, for treatment at the Thor Chemicals plant near

C&EN staff photo

Sander: learning to be competitive

Durban, has become an international cause célèbre. According to the International Federation of Chemical, Energy & General Workers' Unions (ICEF), in February 1994 a shipment from a polyvinyl chloride (PVC) plant just outside Baton Rouge, La., was due to arrive in South Africa but was recalled at the last minute by the U.S. shipper, Borden, which uses mercury chloride catalyst to produce PVC by the acetylene hydrochlorination process.

The Thor plant, ICEF says, is well known to the international community "because of its atrocious record of workplace safety. Two workers have died at the plant, and 15 have suffered severe health problems." The company

Job: more active in world markets

is currently involved in legal proceedings on 42 separate counts, with its top officers charged with culpable homicide. Other charges include negligence and failure to meet a number of statutory requirements.

"There are so many other obvious problems, it may be difficult to raise the environment to as high a profile as in Europe or in the U.S.," agrees AECI's Sander. "But, too imperfectly, we have had a drive to keep our standards up with the rest of the world. The really horrible environmental problems we haven't had—we have no Rhine River to pollute, for example. Our worst problem is dust, for example, from the older steel processes.

"But if we want to play in the world game, we have to play by those rules. We've looked hard over the past five years," he says, at the company's products and processes. He cites the case of chlorofluorocarbons (CFCs) and the Montreal Protocol on Substances That Deplete the Ozone Layer. "It gave us an opportunity to take actions. But it was also a chance to look at our role in the environment as a whole. It is difficult to say, 'I'm going to change over from making CFCs' without filling in the rest of the sentence, 'and also do . . .' "

Responsible Care program

That kind of corporate soul-searching also opened the doors to the Responsible Care program that the South African chemical industry has just adopted. Says Sentrachem's Lovell, "Our Responsible Care initiative had nothing to do with the new South Africa, but it all came together in the nick of time."

Responsible Care has had an incredible impact on the chemical industry around the world since its inception in Canada in 1985. For the industry in South Africa, it even helped spur the formation about a year ago of a new trade organization, based in Johannesburg, through expansion and joining of more limited groups.

In May, at a seminar sponsored by the new group—the Chemical & Allied Industries Association (CAIA)—the circle was completed. The seminar launched the South African chemical industry onto a committed course to join the worldwide Responsible Care program.

That launch, and subsequent gentle

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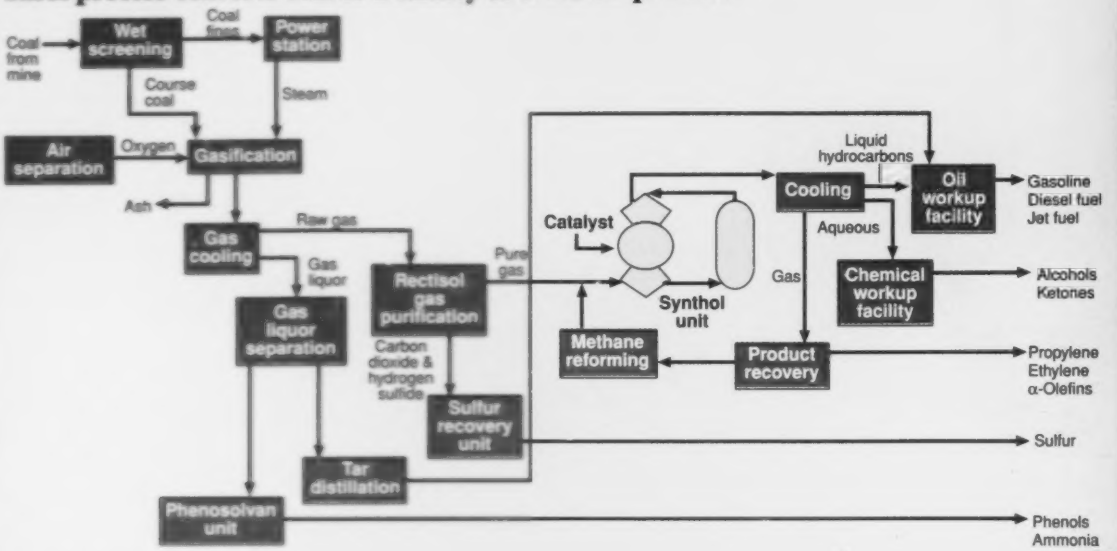
Sasol process converts coal to a variety of chemical products



persuasion, have brought 20 large- and medium-sized South African chemical companies to sign onto Responsible Care as of the middle of July. And many smaller firms will sign up in the near future, predicts Peter Hart, Sentrachem's general manager for health, safety, and the environment, who has been temporarily posted to CAIA to guide its program.

"For the chemical industry [in South Africa], Responsible Care was the right decision," Dietlof Maré, of Shell Oil, and chairman of CAIA, told the seminar in May. "But what about the allied industries? What about, for example, packaging, printing, and chemicals transportation? Our attempt was to bring those industries into the fold of CAIA."

The South African industry's move into Responsible Care brought it firmly into league with the rest of the industrial world, says Louis Jourdan, senior director for technical affairs for CEFIC. Brussels-based CEFIC, as a member of the International Council of Chemical Associations (ICCA), has been allocated sponsorship for Responsible Care development in Africa, as the U.S. has for South America, and Japan and Australia have for the Far East.

He makes yet another point with Responsible Care throughout the world: "Even if [Responsible Care] is a basic entity, it has to be adapted to local and national conditions for specifics. For example, it must fit the legislative framework, public opinion, the culture of companies, and the power of each national association."

According to Sentrachem's Hart: "For signing, it is good to catch the chief executives of the corporations, but we also are encouraging subsidiaries to sign on in their own right, too. We haven't really developed a strategy yet for the really small companies. We will have to monitor what happens over the course of the next year or so, to see what is needed."

Jourdan adds: "You want to get as many companies as possible on board, but the emphasis is on the quality of the response. Nothing is worse than having a company sign on and then not implement Responsible Care."

Additionally, "Dialog with communities and the public is one of the primary things that is different from what we have done in the past," says Hart. CAIA has established a public advisory panel, and companies are being encouraged to communicate at the local level, as well—at factories and storage depots, along transport routes, and so on—"where the action is."

Communication includes a worker's right to know, contends Barry Kistnasamy, who is an environmental health specialist and lecturer at Natal University in South Africa's Natal Province and a health policy adviser to the ANC. The right to know is a critical aspect of new occupational health and safety legislation, he says. From it follows the right of a worker to participate or to refuse dangerous work; "trade unions are lobbying very hard to get this put into legislation."

As Kistnasamy sees it, the new legislation is the latest stage in an evolutionary process in occupational health that began with laissez-faire in the 19th century. He cites the currently unfolding court case against mercury processor Thor Chemicals in Pietermaritzburg, Natal, as a case that is expected to set precedents in terms of the personal liability of corporate executives.

John Mills, who recently retired as administrative manager at AECI's production complex at Umbogintwini, near Durban, is now a consultant to AECI and is responsible for the Community Accident Emergency Response (CAER) program at the plant.

This program was inaugurated following several industrial accidents in 1993: In March 1993, chlorine gas was emitted from another company's factory in a Durban suburb, and people needed treatment. Shortly after that, two releases occurred from AECI's Umbogintwini plant. As one of the country's premier firms, AECI was giv-

en such rough treatment by the press and media that management brought in a team of outside experts to conduct a plant audit, which was finished in June 1993. The verdict: The plant was intrinsically safe but needed about a dozen specific measures to upgrade it to international standards.

The CAER team was given the task of reviewing emergency procedures and improving communication with the public. In fact, it eventually was told to extend its work from the chlorine operations to all those at the complex.

"We started to think of the worst possible accident we could have, for example, considering wind speed, topography, and so on," Mills says. "We wanted to work out what the local community residents should do." Early on, it was realized that to be able to give immediate warning in the event of imminent hazard, the company had to design a suitable audio alarm and public address system, which it is now working on.

The exercise also led to AECI's developing a commitment charter to the community, which the company's top executives signed on May 4 with community leaders, detailing the obligations the company accepted to be a good, responsible member of the community. "The signing of the Umbogintwini charter represents a giant step into the modern world," said company chairman Sander at the signing of the charter.

Such consultation and discussion are becoming the norm in the new South Africa, says David Baldwin, technical director of Waste-Tech, a company specializing in handling both routine and hazardous wastes. Speaking at the May seminar, he detailed just what happens when a company doesn't consult, using his company as an example of one caught by changing standards.

In 1986, Waste-Tech began looking for a replacement for its hazardous waste landfill near Johannesburg, he says. The Johannesburg region houses most of the country's chemical industry.

It found a site that would serve Waste-Tech's needs and could be made to address any conditions of the various authorities. Purchase was permitted under the authority of the Water Affairs Environmental Conservation Act of 1970. Construction started early in 1993.

At the time of the purchase, approval by local authorities was considered to be community approval as well. But, Baldwin comments, "by 1990, people were beginning to expect to be asked. And there were changes—squatters, homes, some light industry, and a new community no more than 500 yards from our site."

The municipality began to back off; they didn't want to make any decisions, Baldwin figures. "And we had trouble finding who actually represented the communities that had sprung up."

Now, after years of planning and nearly $3 million of capital investment, the project is dead, he says.

Community acceptance, added another seminar participant, is extremely important for new plants. Petro Terblanche, a consultant with CSIR Environmental Services notes: "There are two completely different situations if you are dealing with an existing plant or a new one. An existing factory—although you might not have been or be able to wish it away, and although there might be environmental concerns—is completely different from when an operation is going to begin." Then, she suggests, gaining public acceptance and trust "is 10 times harder."

Moreover, added Kistnasamy, "There will be lots more pressure from the previously shut-out communities to interact with companies. We also need training for people in community participation—in how to be effective community representatives."

From Responsible Care programs just taking shape to new initiatives emphasizing world-scale operations and trade, South Africa's chemical industry clearly faces numerous challenges. Sentrachem's Job summarizes the attitude of many executives in the country's chemical industry when he says: "Looking ahead, we are going to become more active in world markets—either through exports or through the formation of alliances, mergers, and [other agreements] in selected areas outside South Africa. The world is going to see more of us." □

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CIRCLE 6 ON READER SERVICE CARD

Biotechnology firms show mixed performance

In the first half of 1994, biotechnology companies again were all over the map with their financial results. The already prosperous, larger companies reported further growth in revenues but a mixed earnings performance. At the same time, smaller companies posted increased revenues but continued to stack up sizable losses.

Only four of 20 companies polled by C&EN reported net earnings for the first half of 1994, and all four had double-digit profit margins. The industry leader is Amgen, with net earnings of $201 million, up 6% from the same period in 1993. Amgen's revenues increased 19% to $779 million. Nearly all of the Thousand Oaks, Calif.-based company's revenues are from sales of its two leading biopharmaceutical products, the white blood cell stimulant Neupogen and the red blood cell stimulant Epogen.

Following Amgen in second place is Genentech, based in South San Francisco. The first half of 1994 was a tremendous comeback period for Genentech. The company posted revenues of $394 million, up 22% from the same period in 1993. Net earnings jumped 192% to $72.2 million, attributed to keeping costs level while increasing sales of human growth hormones, the anti-blood-clotting agent tissue plasminogen activator γ-interferon, and the cystic fibrosis drug Pulmozyme.

Genzyme, whose 14% sales increase to $149 million in first-half 1994 ranks it third among the biotechnology firms polled, reported a 22% decline in earnings to $17.6 million. However, the Cambridge, Mass.-based company's position remains strong—having received Food & Drug Administration approval for Cerezyme, a recombinant enzyme for treating Gaucher's disease and having expanded its business through acquisitions (C&EN, Aug. 1, page 7).

Biogen was the only other biotech firm to post earnings for the first half of 1994. The company did see an earnings drop of 30% from the same period in 1993, to $11.8 million, largely reflecting a 54% increase in R&D spending to nearly $50 million. Biogen's profit margin remained strong at a very respectable 14.5% as revenues grew 11% to $81.6 million for the Cambridge, Mass.-based firm.

Other companies, such as Genetics Institute, Immunex, and Centocor, continue to report sizable revenues but have not yet turned the corner to profitability. Cambridge, Mass.-based Genetics Institute's revenues were up 11% to $51.7 million, largely because of increased product sales and royalties for its first proprietary product, the anti-hemophilia blood-clotting factor VIII.

Similarly, Centocor's revenues increased 10% in the first half of 1994. The company has been working to cut costs and has succeeded in reducing its net loss in the first half of this year to $29.2 million from $42.1 million in the first-half of 1993, excluding special charges in both years. Having stopped development and marketing of its leading antisepsis product, the Malvern, Pa.-based company is making progress with three other products: an anti-blood-clotting drug, a colorectal cancer drug, and an anti-inflammatory agent.

For the first six months of 1994, Seattle-based Immunex reported a net loss of $20.1 million on revenues of $73.5 million. No comparison was made to the year-earlier period, because the company merged with Lederle Laboratories' oncology business on June 1, 1993. Quarterly product sales of Immunex's white blood cell stimulant, Leukine, have remained level, at about $11 million. The company is now focusing on increasing market share, as well as on reducing expenses and testing new anticancer agents.

The gap between biotechnology companies becomes more and more apparent with each passing quarter. Whereas Amgen's tremendous revenues come largely from product sales, many other less successful companies have only a few million dollars in revenues, with the majority of it coming from contract R&D funding. Large decreases in revenues for the smaller companies often occur when a funded project is completed or canceled. Large increases generally reflect changes from very low levels in the previous year.

Cytogen's 91% decrease in revenues is the result of having not received license or contract revenues from Cyto-Rad, an R&D company it formed in early 1992 (C&EN, June 13, page 34). Cytogen and other companies are facing rapidly dwindling cash reserves with which to fund R&D and business operations.

Ann Thayer

Only a few biotech firms had profits in first-half 1994

$ Millions	Revenues[a]	Earnings	Change from first-half 1993		Profit margin[b]	
			Revenues	Earnings	1993	1994
Amgen	$778.7	$200.9	19%	6%	29.0%	25.8%
Biogen	81.6	11.8	11	–30	23.1	14.5
Cell Genesys	5.5	–6.1	93	nm	def	def
Centocor	31.7	–29.2	10	nm	def	def
CytoTherapeutics	1.7	–7.1	156	nm	def	def
Cytogen	0.6	–13.1	–91	nm	def	def
Genentech	393.8	72.2	22	192	7.7	18.3
Genetics Institute	51.7	–19.6	11	nm	def	def
Genzyme	148.7	17.6	14	–22	17.2	11.8
IDEC Pharmaceuticals	2.8	–10.3	-65	nm	def	def
Immune Response	2.6	–9.9	5	nm	def	def
Immunex	73.5	–20.1	na	na	na	def
Isis Pharmaceuticals	8.9	–6.8	49	nm	def	def
Repligen	11.3	–10.7	–17	nm	def	def
Ribi ImmunoChem	2.4	–1.6	52	nm	def	def
Tellos Pharmaceuticals	0.9	–11.8	–6	nm	def	def
U.S. Bioscience	4.2	–12.9	–27	nm	def	def
Vertex Pharmaceuticals	10.4	–8.8	67	nm	def	def
Vestar	21.1	–3.1	16	nm	3.0	def
Xoma	1.6	–15.5	256	nm	def	def

a Includes product sales, contract research, royalty, and interest revenues for first six months of calendar year. b After-tax income as percentage of sales. **def** = deficit. **nm** = not meaningful. **na** = not available.